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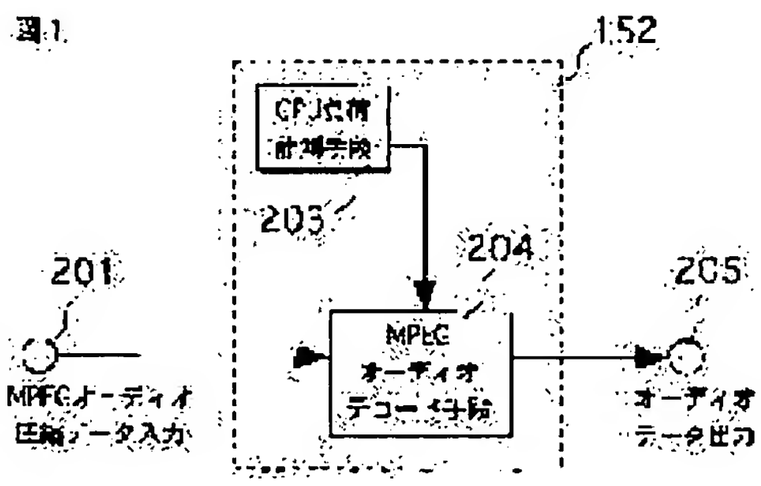
(54) EXTENSION DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To prevent voice from being interrupted.
SOLUTION: When an extension device is configured comprising a CPU 152 for extension-processing of compressed data, the extension device is provided with a measuring means 203 for measuring a load of the CPU, and a decoding means 204 for extending the compressed data but being able to partly omit the contents of the extension processing thereafter according to a measurement result by the above measuring means during the extension processing period, and the contents of the processing by the above decoding means is partly omitted based on the measurement result by the above measuring means, and thus, the load of the above CPU is reduced, thereby prevents the voice from being interrupted.



CLAIMS

[Claim(s)]

[Claim 1]An expanding device comprising:

A measurement means for the above-mentioned central processing unit to measure load of the above-mentioned central processing unit including a central processing unit which performs elongation processing of compressed data.

Compressed data is elongated, and it responds to a measuring result in the above-mentioned measurement means in the elongation processing period concerned, and is an omissible decode means selectively about the contents of subsequent elongation processing.

[Claim 2]An expanding device comprising:

A measurement means for the above-mentioned central processing unit to measure load of the above-mentioned central processing unit including a central processing unit which performs elongation processing of compressed data.

It is an omissible decode means selectively about the contents of elongation processing by elongating compressed data and decreasing the number of

subbands made into a subsequent elongation processing object according to a measuring result in the above-mentioned measurement means in the elongation processing period concerned.

[Claim 3]An expanding device comprising:

A central processing unit which performs elongation processing of compressed data.

Temporarily output data of the above-mentioned central processing unit including a memory measure which can be held the above-mentioned central processing unit, A measurement means for measuring load of the above-mentioned central processing unit based on a data residue in the above-mentioned memory measure, It is an omissible decode means selectively about the contents of elongation processing by elongating compressed data and decreasing the number of subbands made into a subsequent elongation processing object according to a measuring result in the above-mentioned measurement means in the elongation processing period concerned.

[Claim 4]Conditions of elongation processing of compressed data including an

external input device which can be set up to a central processing unit which performs elongation processing of compressed data, and the above-mentioned central processing unit the above-mentioned central processing unit, An expanding device which includes an omissible decode means for the contents of elongation processing selectively, and is characterized by things according to elongation processing conditioning from the above-mentioned external input device.

[Claim 5]An expanding device of claim 1 thru/or 4 which elongates MPEG audio compressed data which has an input terminal for incorporating compressed data based on an MPEG audio as the above-mentioned compressed data, and in which the above-mentioned decode means was incorporated via the above-mentioned input terminal given in any 1 paragraph.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]Concerning the expanding device and the noise

reduction-ized art [in / further / it] which elongate compressed data, this invention is applied to a portable information device, and relates to effective art.

[0002]

[Description of the Prior Art]It is standardized about the audio encoding art in MPEG (Moving Picture Experts Group) by "ISO/IECIS 11172-3" which is international standards. In this specification, the art standardized in this "ISO/IECIS 11172-3" is called an "MPEG audio." using MDCT (modification discrete cosine transform) in an MPEG audio with 32 band subband coding (formation of a zone part tally item) -- an acoustic sense -- efficient compression is realized using the mental characteristic. The elongation processing device of the data (it is called "MPEG audio compressed data") compressed based on the MPEG audio is realized by executing the program defined beforehand in a central processing unit (CPU).

[0003]As an example of the literature in which the MPEG audio was indicated, there is "newest MPEG textbook (the 167page-)" published from ASCII, Inc. on September 1, 1997.

[0004]

[Problem(s) to be Solved by the Invention]In the conventional expanding device,

it assumed always filling the maximum which can process CPU which the sum total of the maximum of the throughput which speech processing and other processings take to the function of a customer system uses, and normal operation of the system was always able to be guaranteed. However, in the customer system assumed from now on, it is carried out by two or more processings standing in a row, and exceeding the maximum which the sum total of the throughput can process [of CPU] is expected. When such a customer system performs speech processing, voice response breaks off without the ability to maintain an audio real-time operation, and there is a possibility of generating a jarring noise to a user by it.

[0005]The purpose of this invention is to provide the art for preventing voice response from breaking off without the ability to maintain a real-time operation.

[0006]The other purposes and the new feature will become clear from description and the accompanying drawing of this specification along [said] this invention.

[0007]

[Means for Solving the Problem]It will be as follows if an outline of a typical thing is briefly explained among inventions indicated in this application.

[0008]Namely, when an expanding device is constituted including CPU which performs elongation processing of compressed data, A measurement means for measuring load of the above-mentioned CPU and compressed data are elongated, and an omissible decode means is selectively provided for the contents of subsequent elongation processing in the above-mentioned CPU according to a measuring result in the above-mentioned measurement means in the elongation processing period concerned.

[0009]According to the above-mentioned means, a measurement means measures load of the above-mentioned CPU, and a decode means omits the contents of subsequent elongation processing selectively according to a measuring result in the above-mentioned measurement means. Thus, omitting the contents of elongation processing selectively can reduce load of the above-mentioned CPU, a sound breaks off and this attains prevention.

[0010]When an expanding device is constituted including CPU which performs elongation processing of compressed data, A measurement means for measuring load of the above-mentioned CPU and compressed data are elongated, An omissible decode means can be selectively provided for the contents of elongation processing in the above-mentioned CPU by decreasing

the number of subbands made into a subsequent elongation processing object according to a measuring result in the above-mentioned measurement means in the elongation processing period concerned.

[0011]When a memory measure which can be held is temporarily included for output data of CPU which performs elongation processing of compressed data, and this CPU, A measurement means for measuring load of the above-mentioned CPU based on a data residue in the above-mentioned memory measure, An omissible decode means can be selectively provided for the contents of elongation processing in the above-mentioned CPU by elongating compressed data and decreasing the number of subbands made into a subsequent elongation processing object according to a measuring result in the above-mentioned measurement means in the elongation processing period concerned.

[0012]When an external input device which can set up conditions of elongation processing of compressed data is included to CPU which performs elongation processing of compressed data, and the above-mentioned CPU, according to elongation processing conditioning from the above-mentioned external input device, an omissible decode means can be selectively provided for the contents

of elongation processing in the above-mentioned CPU.

[0013]And an input terminal for incorporating compressed data based on an MPEG audio as the above-mentioned compressed data can be provided.

[0014]

[Embodiment of the Invention]The portable information device with which the expanding device concerning this invention was applied is shown in drawing 14. Although this information portable device in particular is not restricted, Various programs and data. The memorizable memory 151, The speech output units 155, such as a loudspeaker for the display 154 for CPU(central processing unit) 152 for performing data processing according to the program defined beforehand, a variety of information, the keyboard 153 for a command input, and an information display and voice response and headphone, are included.

[0015]The above-mentioned memory 151 contains RAM (random access memory) which memorizes the program memory which stores the various programs executed by the above-mentioned CPU152, and the data made into the object of data processing of above-mentioned CPU152. The program for elongating the speech compression data based on the operating system (OS) and MPEG audio standard which are the operating systems of a system, the

program for measuring the load of above-mentioned CPU152, etc. are memorized by the above-mentioned program memory. The speech compression data based on an MPEG audio standard is memorized by the above-mentioned RAM, and is transmitted to the above-mentioned CPU152 for extension.

[0016]By the program for decoding the voice data (MPEG audio compressed data) compressed by the MPEG audio standard being executed by the above-mentioned CPU152, the MPEG audio decode means 204 for elongating MPEG audio compressed data is formed. A CPU-load measurement means is formed by the program for load measurement being executed by the above-mentioned CPU152.

[0017]In the above-mentioned composition, if the start of extension of MPEG audio compressed data is directed by the user via the keyboard 153, The MPEG audio decode means 204 is started by executing the program for forming the MPEG audio decode means 204 in CPU152. The speech compression data based on an MPEG audio standard is elongated by this MPEG audio decode means 204, and that extension result is outputted from the loudspeaker of the speech output unit 155, etc. At this time, the status displays "under reproduction" etc. are performed on the display 154.

[0018]The prime function in the above-mentioned CPU152 is shown in drawing 1.

[0019]As shown in drawing 1, the above-mentioned CPU152 is provided with the following.

The CPU-load measurement means formed by executing the program for measuring the load of CPU152.

The MPEG audio decode means 204 formed by executing the program for elongating the speech compression data based on an MPEG audio standard.

[0020]The MPEG audio compressed data in which 201 is incorporated via an input terminal, and 205 are digital audio information. The MPEG audio compressed data 201 is outputted as the audio information 205, after elongation processing is performed by the MPEG audio decode means 204. At this time, the MPEG audio decode means 204 omits a part of elongation processing according to that value with reference to the CPU-load value obtained by the CPU-load measurement means 203. Thus, by omitting a part of elongation processing, the load of CPU152 is reduced and the real-time operation of elongation processing is maintained. The way piece of the sound at the time of obtaining the audio information 205 is prevented by this. By that is, the thing for

which a part of elongation processing in the MPEG audio decode means 204 is omitted in the system shown in drawing 1 based on the measuring result of the CPU-load measurement means 203. The throughput which elongation processing takes is adjusted automatically and the way piece of the sound at the time of elongating the audio information 205 by it is prevented.

[0021]The flow of the above-mentioned elongation processing performed by the MPEG audio decode means 204 is shown in drawing 3.

[0022]If MPEG audio compressed data is inputted into this decode means 204 (Step 31), the MPEG audio decode means 204 will acquire the CPU-load value X from the CPU-load measurement means 203 first (Step 31). The MPEG audio decode means 204 compares the threshold A currently held inside as this measuring result X and an initial value (Step 33). In this comparison, when the measuring result X is judged to be smaller (Yes) than the threshold A, by the MPEG audio decode means 204, elongation processing thoroughly based on the MPEG audio standard is performed (Step 34), and the audio information based on it is outputted (Step 36). When the measuring result X is judged to be (No) which is not smaller than the threshold A, in comparison of the above-mentioned step 33 the MPEG audio decode means 204, Elongation

processing which omitted a part of processing indicated to the MPEG audio standard is performed (Step 35), and the audio information 205 based on it is outputted (Step 36).

[0023]The fundamental procedure of the CPU-load measurement processing by the CPU-load measurement means 203 is shown in drawing 2.

[0024]First, the CPU-load value X1 measured last time is passed to the MPEG audio decode means 204 (Step 142). Timer value B is acquired as decoding start time (Step 143). And distinction of whether processing by the MPEG audio decode means 204 was completed is performed (Step 144). When it is judged that processing was completed in this distinction (Yes), timer value C is acquired as decoding finish time (Step 145). It is repeated until it is judged that processing ended distinction of the above-mentioned step S144 (Yes). The header information data D is acquired from the MPEG audio decode means 204 (Step 146), and the regeneration time E of one frame is computed from this header information data (Step 147). And the CPU-load value X2 is computed. This CPU-load value X2 is calculated by a following formula.

[0025]

[Equation 1]X2=(C-B)/E[0026]Thus, the obtained CPU-load value X is saved in

the memory 151 (Step 149), and is referred by the MPEG audio decode means 204.

[0027]A temporal change of the contents of CPU processing in case CPU152 performs only elongation processing of an MPEG audio is shown in drawing 4. As for 401, elongation processing finish time of the frame and 403 are the elongation processing start time of the N+1st frames elongation processing start time of a frame of eye N (N= 1, 2 and 3, --) watch, and 402. Here, it is a unit of MPEG audio compressed data indicated to be a frame to an MPEG audio standard. A difference of the elongation processing start time 401 of the Nth frame and the elongation processing start time 403 of a frame of the N+1st ** is equal to time (it is hereafter called regeneration time of one frame) to reproduce audio information which elongated MPEG audio compressed data of one frame.

[0028]The CPU-load measurement means 203 measures the elongation processing start time 401 and the elongation processing finish time 402 of the Nth frame, and computes a CPU-load value according to several 1.

[0029]A difference of the elongation processing finish time 402 of the Nth frame and the elongation processing start time 403 of the N+1st frames is time when CPU152 is not performing data processing.

[0030]A temporal change of the contents of CPU processing in case CPU processes MPEG audio elongation processing and a little others is shown in drawing 5. Elongation processing start time of the Nth frame and 502 501 Elongation processing finish time of the frame, The processing finish time and 506 are the start time of the 2nd processing of those other than elongation processing start time of the 1st processing of those other than elongation processing performed by 503 interrupting elongation processing start time of the N+1st frames, and 504 interrupting elongation processing of the Nth frame temporarily, and 505.

[0031]The CPU-load measurement means 203 measures the elongation processing start time 501 and the elongation processing finish time 502 of the Nth frame. Compared with a CPU-load value in a case of being shown in drawing 4 (time), only a difference of the start time 504 and the processing finish time 505 of the 1st processing of those other than elongation processing of this CPU-load value (time) is large. Thus, when other processings are performed in the middle of elongation processing, CPU-load measurement also including the processing time is performed. For example, at drawing 5, there are few throughputs other than elongation processing, if a CPU-load value (time) shall

be less than a threshold which the MPEG audio decode means 204 has, by the MPEG audio decode means 204, it will be thoroughly based on an MPEG audio standard, and it will be processed.

[0032]Here, in a device (refer to drawing 2) made into a comparison object of an expanding device concerning this invention, a case where CPU processes MPEG audio elongation processing and a lot of others is explained. A temporal change of the contents of CPU processing in this case is shown in drawing 6. Elongation processing start time of the Nth frame and 602 601 Elongation processing finish time of the frame, Time when elongation processing of the N+1st frames must be started essentially 603, It is the start time of the 2nd processing of those other than elongation processing performed by start time of the 1st processing of those other than elongation processing performed by 604 interrupting elongation processing of the Nth frame temporarily and 605 interrupting the processing finish time, and 606 interrupting elongation processing of the Nth frame temporarily.

[0033]What added a difference of the start time 506 and the processing finish time 503 of the 2nd processing of those other than elongation processing to a difference of the start time 504 and the processing finish time 505 of the 1st

processing of those other than elongation processing in drawing 5, Latter one is large when what added a difference of the start time 606 and the processing finish time 603 of the 2nd processing of those other than elongation processing to a difference of the start time 604 and the processing finish time 605 of the 1st processing of those other than elongation processing in drawing 6 is compared. Under this influence, a difference of the elongation processing start time 601 of a certain frame and the elongation processing finish time 602 is over regeneration time of one frame. In this case, since elongation processing does not meet the deadline to an output of audio information, real-time reproduction is unmaintainable.

[0034]In composition shown in drawing 1, a temporal change of the contents of CPU processing in case CPU processes MPEG audio elongation processing and a lot of others is shown in drawing 7. Elongation processing start time of the Nth frame and 702 701 Elongation processing finish time of the frame, The processing finish time and 706 are the start time of the 2nd processing of those other than elongation processing start time of the 1st processing of those other than elongation processing performed by 703 interrupting elongation processing start time of the N+1st frames, and 704 interrupting elongation processing of the

Nth frame temporarily, and 705. It is assumed that a CPU-load value is over a threshold in elongation processing of the N-1st frames.

[0035]Since a CPU-load value in elongation processing of the N-1st frames is over a threshold, elongation processing of the Nth frame omits a part of processing described to an MPEG audio standard, and is performed. For this reason, a difference of the elongation processing start time 701 and the elongation processing finish time 702 of a frame of the Nth frame is smaller than a difference of the elongation processing start time 701 of the Nth frame, and the processing start time 703 of the N+1st frames. That is, time which elongation processing of the Nth frame takes is shorter than regeneration time of one frame, and real-time reproduction is maintained.

[0036]Next, elongation processing in the MPEG audio decode means 204 is explained in full detail.

[0037]Structure of MPEG audio compressed data compressed based on an MPEG audio standard is shown in drawing 8. As shown in drawing 8, MPEG audio compressed data includes the header information data 801, the error check code 802, the bit assignment information data 803, the scale-factor-information data 804, the subband sample data 805, and the

ancillary data 806.

[0038]Information about audio bit streams, such as a synchronized signal, is stored in the above-mentioned header information data 801, and a CRC code for checking a data error of a transmission route is stored in the above-mentioned error check code 802. Information on the number of bits that the bit assignment information data 803 is assigned to each subband sample data is stored, and information on a level of data is stored in the above-mentioned scale-factor-information data 804. The above-mentioned subband sample data 805 is the information which divided and compressed the HARASHIN item into a frequency component called 32 subbands, and the above-mentioned ancillary data 806 is data inserted if needed between headers of the following frame.

[0039]The MPEG audio decode means 204 compares a CPU-load value and a threshold of the N-1st frames, before performing elongation processing of the Nth frame. When a measuring result is beyond a threshold, a part of processing described to an MPEG audio standard is excluded, and elongation processing is performed.

[0040]When excluding a part of elongation processing, processing about 16 subbands by the side of low frequency is performed among frequency

components called 32 subbands, and processing about 16 subbands by the side of high frequency is omitted. In an MPEG audio, even if it omits elongation processing about 16 subbands by the side of high frequency, it can be managed with slight tone quality degradation.

[0041]The MPEG audio decode means 204 can acquire a storing method of the scale-factor-information data 804 and data corresponding to each subband in the subband sample data 805 in analyzing the bit assignment information 803. The MPEG audio decode means 204 data corresponding to 16 subbands by the side of after-analysis high frequency for the bit assignment information 803 A skip, Quantity of elongation processing is reduced by performing processing of the scale-factor-information data 804 corresponding to 16 subbands by the side of low frequency, and the subband sample data 805, excluding processing corresponding to it.

[0042]According to the above-mentioned example, the following operation effects can be obtained.

[0043](1) In a device which performs extension and reproduction of speech compression data based on an MPEG audio standard, A throughput which elongation processing of an MPEG audio takes can be reduced by excluding a

part of processing indicated to an MPEG audio standard based on comparison with a measuring result of a CPU measurement means, and a threshold. For example, when excluding 16 sub band processings by the side of high frequency, as compared with a case where 32 sub band processings are performed, elongation processing can be about performed by one half of throughputs.

[0044](2) Even when two or more processings are performed in parallel in CPU152, since an audio real-time operation is maintainable, a sound can be prevented from breaking off by a operation effect of the above (1).

[0045]Although an invention made by this invention person above was explained concretely, it cannot be overemphasized that it can change variously in the range which this invention is not limited to it and does not deviate from the gist. For example, many modifications can be considered as shown below. In a modification shown below, identical codes are given to what has the same function as the above-mentioned example.

[0046]The 1st modification is explained.

[0047]A temporal change of the contents of CPU processing in case CPU152 performs only elongation processing of an MPEG audio is shown in drawing 9. Elongation processing start time of the N-2nd frames and 902 901 Elongation

processing finish time of the frame, As for elongation processing finish time of the frame, and 905, 903 is [elongation processing finish time of the frame and 907] the elongation processing start time of the N+1st frames elongation processing start time of the Nth frame, and 906 elongation processing start time of the N-1st frames, and 904.

[0048]When performing elongation processing of the N+1st frames, an average of three measuring results obtained from a difference of N-2 before it, N-1, elongation processing start time of each Nth frame, and elongation processing finish time by performing CPU-load measurement of each frame is obtained. In the above-mentioned example, although last CPU-load measured value and a threshold of a frame were compared, average value and a threshold of CPU-load measured value are compared here. For example, when only a CPU-load value of the Nth frame is over a threshold, in the above-mentioned example, are carried out by certainly omitting a part of elongation processing of the N+1st frames, but. In an example shown in drawing 9, in order to use an average of a CPU-load value about three frames, elongation processing is not necessarily omitted about the N+1st frames. Thus, by using an average of a CPU-load value, a change to elongation processing which excluded a part of

processings, and elongation processing thoroughly based on an MPEG audio standard decreases as compared with the above-mentioned example. This means that a change rate of an audio information output in which tone quality deteriorated, and an audio information output without degradation decreases, and good tone quality hears it by the time of a user hearing audio information.

[0049]In order to be the target of elongation processing to which a part of Nth frame was abbreviated, three frames before that must have a respectively to some extent big CPU-load measurement result. In this case, it is because the rate of change of average value becomes small rather than an independent rate of a CPU-load value change like [in the case of the above-mentioned example].

[0050]Same effect is acquired even if an average of a CPU-load value of not only three pieces but N frames is used for it, when an example shown in drawing 9 obtains an average of a measuring result.

[0051]The 2nd modification is explained.

[0052]Another flow of elongation processing is shown in drawing 10. The MPEG audio decode means 204 as which MPEG audio compressed data was inputted first acquires information which shows whether elongation processing by which a part of front frame was abbreviated to the CPU-load value X was carried out

from the CPU-load measurement means 203 (Step 102,103). When elongation processing to which a part of front frame was abbreviated is carried out, the MPEG audio decode means 204 compares this measuring result X with the threshold A currently held inside as an initial value (Step 104). When the measuring result X is smaller than the threshold A, the MPEG audio decode means 204 performs elongation processing thoroughly based on an MPEG audio standard (Step 106), and outputs audio information (Step 110). To it, when the measuring result X is beyond the threshold A, the MPEG audio decode means 204 performs elongation processing which omitted a part of processing indicated to an MPEG audio standard (Step 107), and outputs audio information (Step 110).

[0053]On the other hand, when a front frame is thoroughly based on an MPEG audio standard and elongation processing is carried out to it, same processing is performed instead of the threshold A using the threshold B (Step 105,108,109,110).

[0054]In an example shown in drawing 10, when the three or more states where a CPU-load value exceeded a threshold continue, a change to elongation processing which excluded a part of processings, and elongation processing

thoroughly based on an MPEG audio standard decreases. Hereafter, the reason is explained.

[0055]When it not being concerned with a CPU-load value and not omitting elongation processing as an example is assumed, the state where a threshold was exceeded considers a case of N, N+1, and the N+2nd frames where a total of three frames continues.

[0056]If elongation processing to which a part of the N+1st frames were abbreviated is carried out and a CPU-load value of that frame becomes below in a threshold, it is possible that elongation processing to which the N+2nd frames were thoroughly based on an MPEG audio standard is carried out, and that CPU-load value exceeds a threshold as a result.

[0057]On the other hand, although elongation processing to which a part of the N+1st frames were abbreviated is carried out and a CPU-load value of the frame becomes in processing shown in drawing 10 below in the threshold B, When elongation processing to which a part of front frame was abbreviated is carried out, in order to compare with a CPU-load value using the threshold A which is a value smaller than the threshold B and to use a threshold according to an extension method of a front frame, A change to elongation processing which

excluded a part of processings, and elongation processing thoroughly based on an MPEG audio standard decreases.

[0058]This means that a change rate of an audio information output in which tone quality deteriorated, and an audio information output without degradation decreases, and good tone quality hears it by the time of a user hearing audio information.

[0059]The 3rd modification is explained.

[0060]Another flow of elongation processing is shown in drawing 11. The MPEG audio decode means 204 into which MPEG audio compressed data was inputted acquires the CPU-load value X from a CPU-load measurement means first. The MPEG audio decode means 204 compares this measuring result X with the threshold A currently held inside as an initial value (Step 113). When the measuring result X is smaller than the threshold A, the MPEG audio decode means 204 performs elongation processing thoroughly based on an MPEG audio standard (Step 115), and outputs audio information (Step 118). To it, when the measuring result X is beyond the threshold A, comparison with the threshold B is performed further (Step 114), The MPEG audio decode means 204 performs elongation processing which omitted a part of processing indicated to

an MPEG audio standard (Step 116), and outputs audio information (Step 118). When a measuring result is beyond the threshold B at this time, quantity which elongation processing omits compared with a case where it is less than the threshold B is increased (Step 117). That is, the quantity omitted by elongation processing of Step S117 is more than quantity omitted by elongation processing of Step S116.

[0061]In drawing 11, regulation of a throughput which elongation processing of a three-stage takes by using two thresholds is realized (Step 115,116,117). Regulation of a throughput which N+1 step of elongation processings take is realizable by using a threshold of N pieces.

[0062]The 4th modification is explained.

[0063]When a CPU-load value was compared with a threshold and regulation of a throughput is needed, processing is excluded in a unit of a subband shown in an MPEG audio standard, but when reducing a throughput, it is not limited to decreasing the number of subbands to process from 32 to 16. In the modification 4, when reducing a throughput of a certain frame, processing of the number of subbands of N pieces is excluded. When a CPU-load value is over a threshold again with the following frame, processing of the number of subbands of N more

pieces is excluded. When less than a threshold, processing of the number of subbands of N pieces is increased. For example, in the case of N= 8, if a threshold is exceeded with a certain frame, only a 32-8=24 piece subband will process, and if a threshold is further exceeded with the following frame, only a 24-8=16 piece subband will process. If less than a threshold with the following frame, a 16+8=24 piece subband will be processed. The number of subbands which will be processed if it becomes N=8, for example can control finely 32, 24, and 16 or 8 regulation of a throughput which elongation processing takes since regulation will become possible in eight steps if it is four steps and becomes N=4 by making small N of a unit which adjusts the number of subbands.

[0064]The 5th modification is explained.

[0065]Another example of composition of an expanding device concerning this invention is shown in drawing 12. Digital audio information to which a CPU-load measurement means is outputted CPU and 203 which are central processing units MPEG audio compressed data inputted 201 and 202, and an MPEG audio decode means and 205 are outputted 204, and 1201 are memories.

[0066]The memory 1201 holds temporarily audio information outputted from the MPEG audio decode means 204. The CPU-load measurement means 203

measures the quantity Y of audio information in an audio data buffer which has not been reproduced yet at the time of an end of elongation processing of a certain frame, and memorizes it. At the time of an elongation processing start of the following frame, the MPEG audio decode means 204 acquires the residue Y of audio information, and compares it with a threshold. Elongation processing thoroughly based on an MPEG audio standard in the MPEG audio decode means 204 when the residue Y was larger than a threshold is performed, and if conversely smaller than a threshold, elongation processing which excluded a part of processing will be performed.

[0067]That is, in the CPU-load measurement means 203 shown in drawing 12, a CPU load is measured based on a residue of the memory 1201 instead of a hour entry. When checking a residue of the memory 1201 at the time of an end of elongation processing of a certain frame, it will become constant [a residue] if elongation processing is always completed by fixed time. If elongation processing finish time becomes later than usual by elongation processing and other processings, a residue will decrease, and if conversely early, a residue will increase. It is possible to measure a CPU load using this.

[0068]The 6th modification is explained.

[0069]Another example of composition of an expanding device concerning this invention is shown in drawing 13. An MPEG audio decode means by which MPEG audio compressed data into which 201 is inputted, and 1301 are realized by external input device, and 1302 is functionally realized by CPU152, and 205 show digital audio information outputted. The external input device 1301 can give conditions (parameter) of an expansion process to the MPEG audio decode means 204.

[0070]The MPEG audio decode means 204 receives an input of a parameter from the external input device 1301 with an input of MPEG audio compressed data. A parameter shows how many processings the MPEG audio decode means 204 needs to exclude by elongation processing. According to an instruction content of a parameter, the MPEG audio decode means 204 omits a part of processings, and performs elongation processing. As a parameter, 32 and 24 or 16 subbands are used as a low three-stage, for example into quantity, respectively.

[0071]Elongation processing becomes possible, choosing one from throughputs which several kinds of elongation processings take, and maintaining the fixed throughput by specification from the outside. For example, when high-quality

sound is called for, a parameter is specified via the external input device 1301 so that processing may not be omitted. The above-mentioned effect is acquired by specifying poor-quality sound via an external input device to lower tone quality, reduce a throughput and give priority to other processings.

[0072]Although the above explanation explained a case where an invention mainly made by this invention person was applied to elongation processing of an MPEG audio which is a field of the invention used as the background, this invention is not limited to it and can be widely applied to various expanding devices. An expanding device concerning this invention is widely applicable to a karaoke system, various game machine machines based on a CD video standard, a CD-ROM player, a videodisc player, etc., for example except the above-mentioned portable information device.

[0073]This invention is applicable on condition that compressed data is dealt with at least.

[0074]

[Effect of the Invention]It will be as follows if the effect acquired by the typical thing among the inventions indicated in this application is explained briefly.

[0075]Namely, when an expanding device is constituted including CPU which

performs elongation processing of compressed data, According to the measuring result in the measurement means for measuring the load of CPU, and the above-mentioned measurement means [in / compressed data is elongated and / the elongation processing period concerned], the contents of subsequent elongation processing by establishing an omissible decode means selectively, Since the contents of processing by the above-mentioned decode means are selectively omitted based on the measuring result of the above-mentioned measurement means and the load of the above-mentioned CPU is reduced by that cause, a sound breaks off and prevention is attained.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is an example block diagram of composition of the expanding device concerning this invention.

[Drawing 2]It is a flow chart with which the general procedure of the CPU-load measurement processing in the above-mentioned expanding device is shown.

[Drawing 3]It is a flow chart which shows the flow of operation of the MPEG audio decode means shown in drawing 1.

[Drawing 4]It is an explanatory view of the temporal change of the contents of CPU processing in case only elongation processing of an MPEG audio is performed by CPU.

[Drawing 5]It is an explanatory view of the temporal change of the contents of CPU processing in case elongation processing of an MPEG audio and processing of a little others are performed by CPU.

[Drawing 6]In the device made into the comparison object of the expanding device concerning this invention, it is an explanatory view of the temporal change of the contents of CPU processing in case CPU processes a lot of others with the elongation processing of an MPEG audio.

[Drawing 7]In the composition shown in drawing 1, it is an explanatory view of the temporal change of the contents of CPU processing in case CPU processes the elongation processing of an MPEG audio, and a lot of others.

[Drawing 8]It is a structure explanatory view of the MPEG audio compressed data compressed based on the MPEG audio standard.

[Drawing 9]In the composition shown in drawing 1, it is an explanatory view of the temporal response of the contents of CPU processing in case CPU performs only elongation processing of an MPEG audio.

[Drawing 10]It is a flow chart with which the flow of extension of MPEG audio compressed data is shown.

[Drawing 11]It is a flow chart with which the flow of extension of MPEG audio compressed data is shown.

[Drawing 12]It is another example block diagram of composition of the expanding device concerning this invention.

[Drawing 13]It is another example block diagram of composition of the expanding device concerning this invention.

[Drawing 14]It is an example block diagram of composition of the portable information device with which the expanding device concerning this invention is applied.

[Description of Notations]

151 Memory

152 CPU

153 Keyboard

154 Display

155 Speech output unit

203 CPU-load measurement means

204 MPEG audio decode means

1201 Memory